

# Clinical Needs of Amputees: Focus on Prosthetics

Jack Uellendahl, CPO



# Prosthetic Feet

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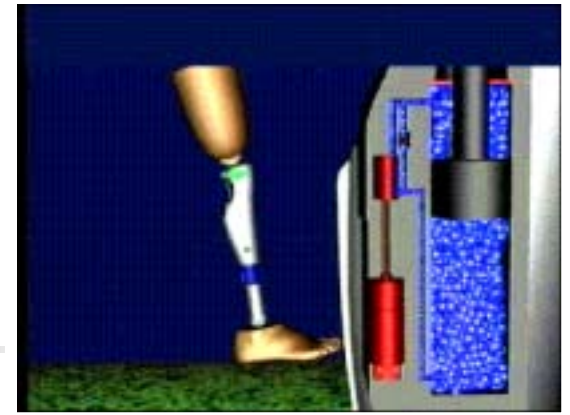
- Need objective analysis of the overwhelming variety of feet
- Compliance characteristics
  - Insufficient/Excessive?
  - Transtibial/Transfemoral?
- Dynamic response characteristics
- Automatic heel height adjustment

# Shock/Torque absorbers

- Excellent feature, probably under utilized due to added weight and length.
- Develop lighter and smaller units
- Study energy cost benefits especially for bilaterals



# Knees



- Microprocessor feature has changed what is possible
- C-Leg is a huge success but only a first step
- Explore myoelectric control
- Explore active control
- Develop polycentric microprocessor, perhaps with separate stance flexion



## Knees cont'

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- Evaluate benefits of stance flexion vs vertical shock
- Evaluate effect of shank COM for optimal knee performance
- Microprocessor knees need to be smaller and lighter
- Wireless programming (Bluetooth?)

# Hips

- Develop hip flexion bias
- Develop coordinated hip/knee function



FIG 21B-5.  
Hip flexion bias system developed by Huxford et al. of Houston. Note the compression spring encircling the thigh tube, which propels the limb forward during the swing phase. (From Michael J. Clin Prosthet Orthot 1988; 12:98-108. Used by permission.)



FIG 21B-8.  
Modified Hydropneumatic knee mechanism to provide smooth, coordinated hip and knee motion, as advocated by Lehneis et al. (From Lehneis HR, et al: Prosthetics Management for High Level Lower Limb Amputees. New York, Institute of Rehabilitation Medicine, 1990. Used by permission.)

# Elevated vacuum sockets



- TT need to improve seal. Failure of the seal at the knee sleeve is the biggest problem.
- Need independent research to validate the findings of Board, Street, Caspers
- Study effect on wound healing
- Study optimal or even acceptable liner materials and thickness



## Vacuum sockets cont'

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- Study optimal vacuum range
- Must be smaller and lighter!



# Cosmetics LL

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- New silicone covers for TT are beautiful, we need high quality finishings for TF





# Socket environment

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- Need better management of sweat in skin fit liner systems

# Upper limb needs





# Hands

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- Hands need to be more compliant
  - Compliance vs grip force
- Variable or adaptive grip patterns
- Lighter weight
- Durable high definition covers

# Elbows

- Hybrid power, i.e. AFB, electric, body-powered
- Automatic lock/unlock with control command (electric or BP)
- Faster- as fast as cable driven
- Lighter



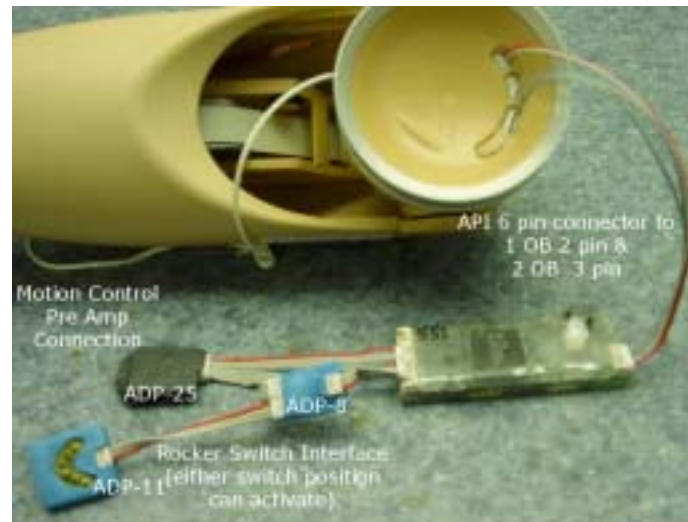
# Shoulder joint

- Need more robust locking joint
- Need reliable and easy lock activation
- Powered shoulder ?



# Prosthesis control

- Pattern recognition for multifunctional control
- Systems that facilitate hybrid control



# Sockets

- Improve 3S myo signal connections





# High Level Bilaterals

- With present technology best results are obtained using a hybrid power/hybrid control approach. This is too often ignored in favor of an all “high-tech” fitting.



# Obstacles to success

- Lack of an experienced TEAM approach
- Resistance in funding either more costly option or multiple prostheses and or multiple terminal devices.

